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ABSTRACT

The relationship between subject of instruction and the classroom behavior of teachers and pupils was assessed in this study. The study was conducted over a two-year period of observation of elementary grade classes. Two variables were investigated: individual pupil participation and teacher verbal behavior. Only two subjects, reading and mathematics, were reported frequently enough to permit comparisons of any statistical power. The results of this study confirmed the hypothesis that the subject of instruction affects classroom behavior. Teaching styles for reading and mathematics were markedly different. Mathematics was more likely than other subjects to be taught as a single lesson to the entire class, and reading was less likely. Mathematics was almost four times as likely as reading to be taught in this way. More interaction between pupil and teacher was observed when the subject of reading was being taught. (JD)

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THE EFFECTS OF SUBJECT OF INSTRUCTION
ON THE BEHAVIOUR OF TEACHERS AND PUPILS

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Wright, Shapson, Eason and FitzGerald (1977a) found that the classroom behaviour of teachers and pupils was almost completely unaffected by class size. Wright and his colleagues pointed out that the teachers they studied had received no training in adapting their teaching to classes of different sizes, so it is perhaps not surprising that their behaviour did not change. However, it is reasonable to expect teachers to adapt their behaviour to changes in other instructional variables, and perhaps the most obvious of these other variables is the subject of instruction.

Marshall, Green, Hartsough, and Tsuji Lawrence (1976) have suggested that subject of instruction may be one of the most powerful variables affecting the behaviour of teachers and pupils. However, about the only study of the relationship between classroom behaviour and the subject of instruction is Olson's (1971). Because the reliability and validity of Olson's measures of classroom behaviour have never been established, this study is highly questionable.

In the study to be reported here, data collected by Wright et al. were analyzed so that the relationships between subject of instruction and the classroom behaviour of teachers and pupils could be assessed. No

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assumptions were made about the direction of any effect. For example, it was not assumed that when reading was taught certain behaviours of teachers of pupils would increase in frequency. The experiments to be reported were designed to find out only if the teaching of a certain subject resulted in a change of any kind in teachers' or pupils' behaviour.

Method

Subjects

Data were gathered from 68 grade 4 and 5 classes in 12 schools in Metropolitan Toronto. Eight of the schools were in the City of Toronto, 2 in North York, and 2 in Scarborough. Some demographic characteristics of the schools are presented in Wright et al. (1977a).

The study was conducted over two years; during each year 34 classes were studied. All but one of the teachers reported that they had volunteered for the study. Thirty-one teachers took part in both years of the study, and seven took part in one year. Twenty-nine teachers were women, and 29 had previously taught grade 4 or grade 5.

These classes were studied by Wright et al. (1977a), although some of the classes were not included in their analyses, and for the purposes of that study class enrolments were kept within certain ranges. Seventeen classes had enrolments of 13 to 19 pupils, 18 had enrolments of 20 to 26, 15 had enrolments of 27 to 33, and 18 had enrolments of 34 to 40.

The sample of pupils in the first year of the study consisted of grade 4 pupils, except for one class of grade 5 pupils. In the second year of the study, the grade 4 pupils moved to grade 5, and the teacher who had had the grade 5 class in the first year taught a grade 4 class. About 70 per cent of the original pupils were still in the sample at the beginning of the second year.

The percentage of Canadian-born pupils in the sample at the beginning of the study -- 72.9 per cent -- was about the same as the percentage for all students in the City of Toronto schools -- 70.1 per cent (Deosaran, Wright, and Kane, 1976). About half, 47.9 per cent, of the pupils reported learning English as their first language. The most frequent other first languages were Greek, Italian, Chinese, Portuguese, Ukrainian, and German.

At the beginning of each year the students of each school were assigned randomly to classes within strata defined by sex and school achievement. No child could be in the smallest class size or the largest class size for both years of the study. The teachers at each school were randomly assigned to classes, with the constraint that if possible no teacher should over two years have classes of either both smaller sizes or both larger sizes (one teacher did teach classes of both smaller sizes).

Variables

As part of the original study, classes were observed with the Individual Pupil Participation (IPP) and Teacher Verbal Behaviour (TVB) sections of the Toronto Classroom Observation Schedule or TCOS (Wright, Shapson, Eason, and FitzGerald, 1977b). Test reliability and observer agreement are discussed by Wright et al. (1977b).

IPP data are collected in sets of 16 observations made at intervals of 15 seconds. In the experiment to be reported, the following dependent variables were analyzed:

- 1) verbal participation, or the number of observations in a set during which a pupil was participating verbally (that is, talking as part of assigned work);
- 2) non-verbal participation, or the number of observations during which a pupil was participating non-verbally;
- 3) general participation, or the sum of verbal and non-verbal participation;
- 4) non-participation, or the number of observations during which the pupil was not participating, although work had been assigned;

- 5) time without work, or the number of observations during which the pupil observed had not been assigned work.

TVB data are collected in sets of 32 observations made at intervals of fifteen seconds. The dependent variables analyzed were:

- 1) the number of utterances about classroom routines and procedures;
- 2) the number of lecturing utterances ("tell" in the TVB category system);
- 3) the number of questions;
- 4) the number of approving utterances about course content;
- 5) the number of disapproving utterances about course content;
- 6) the number of approving utterances about pupils' behaviour;
- 7) the number of disapproving utterances about pupils' behaviour;
- 8) the number of neutral utterances about pupils' behaviour;
- 9) the number of utterances about social and other matters;
- 10) the number of observations during which the teacher was not talking and no pupil was talking as part of a lesson;
- 11) the number of observations during which the teacher was not talking;
- 12) the number of observations during which a pupil was talking as part of a lesson;
- 13) the number of utterances addressed to individual pupils;
- 14) the number of utterances addressed to groups of pupils;
- 15) the number of utterances addressed to the entire class.

The remaining independent variable was simply whether or not a single lesson had been taught to the entire class during the time a set of observations was being made. This information is recorded by the observer for each set of TVB and IPP observations.

Procedure

Observers visited each class eight times during a school year, during the months of October, November, January, February, April and May. Classes were not observed on Monday morning or Friday afternoon; it was decided that, if possible, each class should be observed once on each of the remaining eight half-days of the week. In scheduling visits to classes where fewer than eight half-days were available for observation (because the teacher was not in the classroom all day, for example), it was decided that no more than the smallest possible number of visits should be made on any half-day. These scheduling requirements were met in all but ten classes. Failures to meet the requirements were trivial (see Wright et al., 1977b), except for one class which was observed only three times before the teacher left the study. No observer visited any class more than three times, all observers visited each class at least once, and no more than one observer visited the same class three times. Three rounds of observation were scheduled for a morning visit and two for an afternoon visit, although occasionally fewer rounds were completed when an unforeseen event made completing the scheduled number impossible.

Results

Only two subjects -- reading and mathematics -- were reported frequently enough to permit comparisons of any statistical power. In the investigation of the TVB and IPP variables analysis of variance was used to test differences between group means. All tests were two-tailed. In analyzing the effects of both reading and mathematics, two groups were compared; the first group comprised scores from all sets of observations during which the subject in question was the only subject taught, while the second comprised scores from all sets of observations during which the subject in question was not taught.

The same groups were compared in the investigation of the teaching of single lessons to the entire class. The chi-square test was used to test differences between these two groups in the frequencies of single lessons taught to the entire class. As well, sets of observations during which reading was the only subject taught were compared with sets of observations during which mathematics was the only subject taught.

Reading was the only subject taught during 71 sets of TVB observations and was not taught during 1004; it was the only subject taught during 144 sets of IPP observations, and was not taught during 2061. Mathematics was the only subject taught during 211 sets of TVB observations, and was not taught during 849; it was the only subject taught during 476 sets of IPP observations, and was not taught during 1719.

(a) TVB Variables

When reading was the subject of instruction, the teacher spent less time talking ($F_{1, 1073} = 12.46; p < .001$), and pupils spent more time talking as part of a lesson ($F_{1, 1073} = 61.37; p < .001$). The teacher spent less time talking to individual pupils when reading was the subject of instruction ($F_{1, 1073} = 7.12; p < .01$), more time talking to groups of pupils ($F_{1, 1073} = 64.90; p < .001$), and less time talking to the class as a whole ($F_{1, 1073} = 32.50; p < .001$). Group means are presented in Table 1, along with the percentage of teachers' time the mean represents.

INSERT TABLE 1 ABOUT HERE

When mathematics was the subject of instruction, the teacher talked less frequently about classroom routines and procedures than when it was not taught ($F_{1, 1058} = 5.70; p < .05$). Teachers lectured less frequently when mathematics was the subject of instruction ($F_{1, 1058} = 9.64; p < .01$), they put questions to the class more frequently ($F_{1, 1058} = 28.8; p < .01$), they made more disapproving statements about course content ($F_{1, 1058} = 33.13; p < .001$), more disapproving statements about pupils' behaviour ($F_{1, 1058} = 9.00; p < .01$), and fewer neutral statements about pupils' behaviour ($F_{1, 1058} = 5.19; p < .05$). When mathematics was taught, teachers were more likely to talk to individual students ($F_{1, 1058} = 18.25; p < .001$), and less likely to talk to groups of students ($F_{1, 1058} = 23.09; p < .001$). Pupils spent less time talking as part of a lesson when mathematics was taught ($F_{1, 1058} = 25.93; p < .001$). Group means and percentages are presented in Table 2.

INSERT TABLE 2 ABOUT HERE

(b) IPP Variables

Nonverbal participation was more frequent when reading was taught ($F_{1, 2203} = 2.47; p < .05$) and time without work was less frequent ($F_{1, 2203} = 4.99; p < .05$). Group means and percentages are presented in Table 1.

Verbal participation was less frequent when mathematics was taught ($F_{1, 2154} = 6.68; p < .01$), nonverbal participation was more frequent, ($F_{1, 2154} = 22.03; p < .001$), and time without work was less frequent ($F_{1, 2154} = 9.49; p < .01$). Group means and percentages are presented in Table 2.

(c) The Teaching of Single Lessons to the Entire Class

Although the TVB observation period is twice as long as the IPP observation period, the chi-square test failed to detect any significant differences between the frequency of single lessons during sets of TVB observations and the similar frequency during sets of IPP observations. Consequently, data from both types of observation were combined for the analyses.

Single lessons taught to the entire class were significantly less frequent when reading was the only subject taught than when it was not taught, being seen during 49, or 22.8% of the 215 sets of observations during which reading was the only subject taught, and during 2425, or 79.1%, of the 3065 sets of observations during which reading was not taught ($\chi^2 = 233.4$; $p < .001$).

Single lessons taught to the entire class were significantly more frequent when mathematics was the only subject taught than when mathematics was not taught, being seen during 515, or 87.7 per cent of the sets of observations during which mathematics was the only subject taught, and during 1670, or 65.0 per cent of the sets of observations during which mathematics was not taught ($\chi^2 = 115.7$; $p < .001$).

Finally, a single lesson was taught to the entire class more frequently when mathematics was the only subject taught than when reading was the only subject taught ($\chi^2 = 318.1$; $p < .001$).

Discussion

The results of this study confirmed the suggestion of Marshall et al. (1976) that subject of instruction affects classroom behaviour. Teaching styles for reading and mathematics were markedly different. Mathematics was more likely than other subjects to be taught as a single lesson to the entire class, and reading was less likely. Mathematics was almost four times as likely as reading to be taught in this way.

The teaching of mathematics as a single lesson to the entire class may be due to inadequate training in group methods for teaching mathematics (and may therefore, vary in frequency from one school board to another). On the other hand, group methods may be taught and encouraged, but limitations of time may prevent their being used for all subjects. Preparing courses of study for, working with, and evaluating several groups probably takes more time than teaching single lessons to the whole class, and teachers may find it impossible to organize grouped courses of study in all subjects. They may therefore choose to put the extra effort required for grouped courses of study into the subject they think is the most important and in which they think learning groups would be most effective. Teachers may believe that grouping is more helpful in and necessary to the teaching of reading than of mathematics, and employ group methods mainly in teaching reading.

The difference in class organization may explain some of the other differences observed. For example, when teachers teach a single lesson to the entire class they are probably more likely to pay attention to the behaviour of every child in the class than when they are working with a group. One might then expect them to see more of what they consider to be misbehaviour when teaching a single lesson to the entire class even though in general misbehaviour is no more frequent than usual, or even less frequent. The increase in pupil verbal participation when mathematics was taught suggests that pupils were paying more attention and being less disruptive (verbal participation probably dropped because the teachers concentrated on questions to individual pupils, so that most pupils would not have much chance of participating verbally). The increase in disapproval by the teacher of pupils' behaviour when mathematics was taught, in spite of the increase in nonverbal participation, may be due to teachers' paying more attention to the behaviour of all their pupils. This would not explain why disapproval of pupils' academic contributions also increased, but

this increase may still be due to the way in which mathematics classes were organized. It seems reasonable that when a single lesson is taught to an entire class or pupils who differ greatly in their understanding of mathematics, more pupils are going to have problems understanding the lesson than would have if they were taught in groups varying in understanding of mathematics and for which the lessons were adjusted to the understanding of the group members.

The increase in nonverbal participation when reading is taught and the reduction in time without work suggest that reading classes are more efficiently organized than classes in other subjects. An apparent contradiction exists between the finding that pupils spent more time talking as part of a lesson when reading was taught, and the finding that verbal participation did not increase. However, this difference is probably due to the different ways in which these two types of data were collected. For example, if a class is organized into reading groups, and the teacher is working with a group (teachers were more likely to talk to groups of pupils when reading was taught), the TVB observation system would record the talking of pupils in that group. However, the pupil selected for IPP observation would most likely be a member of another group, and would be more likely to be working silently. Consequently, the increase in verbal participation in the teacher's group would not likely be recorded.

A full explanation of these findings would require a knowledge of teachers' pedagogical approaches to different subjects, of teachers' awareness of the effects of subject of instruction on their behaviour, of pupils' awareness of the effects of subject of instruction on teachers, and of pupils' attitudes to different subject of instruction. Further research should include measures of these variables, and attempt to assess teachers' ideas about and awareness of the effects of subject of instruction on their teaching strategies and on their actual behaviour while teaching, as well as the pupils' perceptions of differences between subjects. The present study has looked at the classroom

more or less from the outside -- it did not look at what pupils and teachers actually thought about what they were doing. What pupils and teachers think about their classroom behaviour may have nothing to do with their actual behaviour, but even that finding would be informative as it would indicate how any understanding we may obtain of the effects of subject of instruction can be used to advise and train teachers. This assumes, of course, that the observed differences in behaviour are related to the effectiveness of teaching.

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TABLE 1
MEANS AND PERCENTAGES FOR TVB AND IPP VARIABLES
WHICH WERE AFFECTED BY THE TEACHING OF READING

Variable	Reading Not Taught		Only Reading Taught	
	<u>$\bar{x}$</u>	<u>%</u>	<u>$\bar{x}$</u>	<u>%</u>
Individual Audience	8.15	25.5	6.42	20.1
Group Audience	1.61	5.0	5.64	17.6
Class Audience	6.48	20.2	1.46	4.6
No Talking by Teacher	15.17	47.4	18.07	56.5
Pupil Talking	4.79	15.0	9.08	28.4
Nonverbal Participation	10.88	68.0	11.62	72.5
Time Without Work	0.90	5.6	0.40	2.5

The above table is referred to on Page 6 of this article.

TABLE 2
MEANS AND PERCENTAGES FOR TVB AND IPP VARIABLES
WHICH WERE AFFECTED BY THE TEACHING OF MATHEMATICS

Variable	Mathematics Not Taught		Only Mathematics Taught	
	$\bar{x}$	$\%$	$\bar{x}$	$\%$
Routines	4.98	15.6	4.23	13.2
Lecturing	5.92	18.5	4.60	14.4
Questioning	2.40	7.5	3.56	11.1
Course Content (disapproving)	0.22	0.7	0.56	1.8
Pupils' Behaviour (disapproving)	0.28	0.9	0.53	1.7
Individual Audience	7.32	22.9	9.00	28.1
Group Audience	2.55	8.0	0.92	2.9
No Talking by Teacher or Pupil	9.44	29.5	12.17	38.0
Pupil Talking	6.05	18.9	4.05	12.7
Verbal Participation	1.19	7.4	0.92	5.8
Nonverbal Participation	10.78	67.4	11.84	74.0
Time Without Work	0.91	5.7	0.50	3.1

The above table is referred to on Page 7 of this article.